U. S. FOREST SERVICE
RESEARCH PAPER NC-12
MAY 1967

INTERMOUNTAIN STATION
Central Reference File
No. 0-73

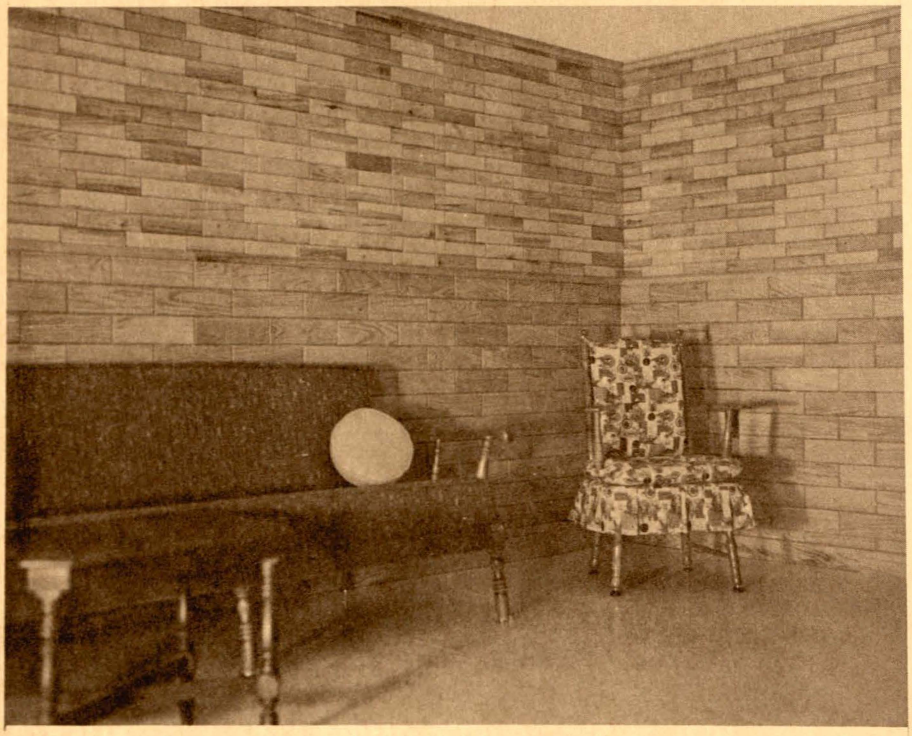
Wood Brick Tile for Paneling

■ Glenn A. Cooper
■ E. Garth Champagne

NORTH CENTRAL FOREST EXPERIMENT STATION
D. B. King, Director
FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Contents

	Page
Making Wood-Brick Tile	2
Home Manufacture	4
Commercial Production	5
Applying Wood Tile	9



F-516317

FIGURE 1. — Walls paneled with two sizes and kinds of wood-brick tile reflect the beauty and warmth of wood. The bottom part of this wall has red oak tile overlapped one-half the tile length in the courses. White ash tile, overlapped one-fourth their length, cover the top part of the wall.

Cooper, Glenn A., and Champagne, E. Garth.

1967. Wood-brick tile for paneling. N. Cent. Forest Exp. Sta., St. Paul, Minn. 11 pp., illus. (U.S. Forest Serv. Res. Pap. NC-12)

Describes styles of hardwood-brick tile paneling; recommends production and installation methods, based on a 5-year test of 1,200 square feet of wood tile on various wall materials.

Cooper, Glenn A., and Champagne, E. Garth.

1967. Wood-brick tile for paneling. N. Cent. Forest Exp. Sta., St. Paul, Minn. 11 pp., illus. (U.S. Forest Serv. Res. Pap. NC-12)

Describes styles of hardwood-brick tile paneling; recommends production and installation methods, based on a 5-year test of 1,200 square feet of wood tile on various wall materials.

Wood-Brick Tile for Paneling

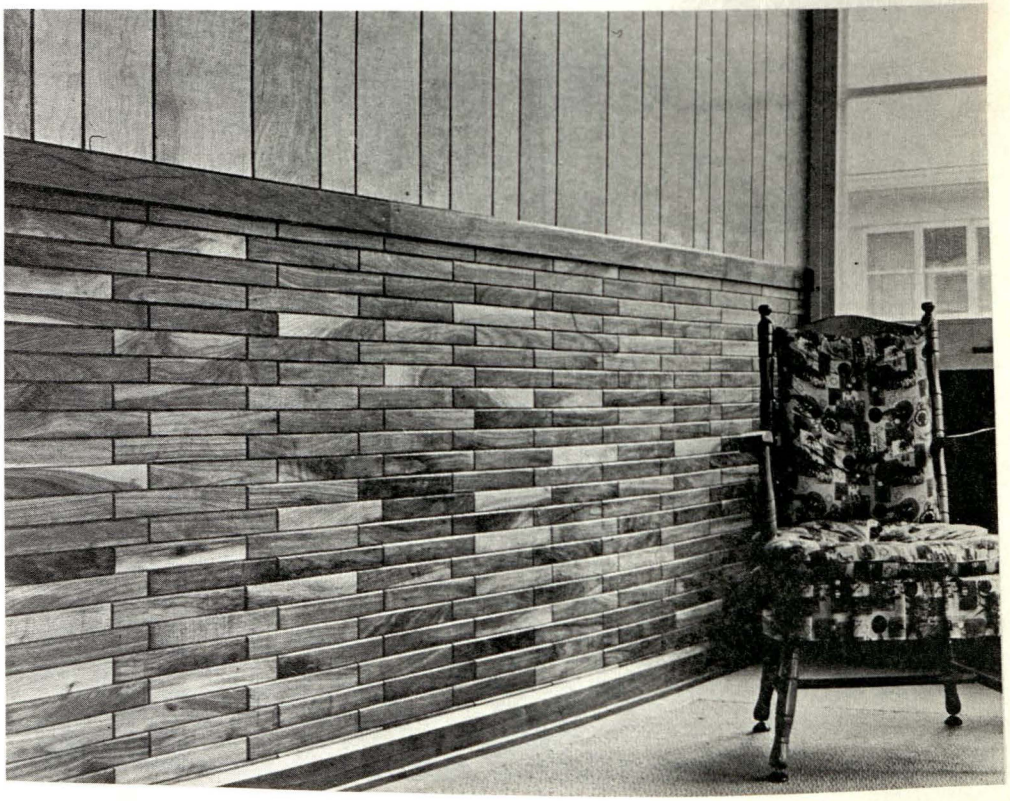
Glenn A. Cooper and E. Garth Champagne

Wood-brick tile is a new decorative paneling for homes, offices, and public buildings. The tiles are thin rectangular pieces of wood with chamfered edges and are applied with an adhesive to produce a brick and mortar pattern. Wood tile panels are especially attractive when made from woods that have a prominent grain or figure (Fig. 1).

Wood-brick tile can be applied to almost any firm dry surface. It can be used for paneling entire walls (fig. 1), as a wainscot (fig. 2), around a fireplace or over the mantel (fig. 3), and for points of interest on a wall. It is especially attractive above a counter (fig. 4) or for planters (fig. 5), facing stair risers, room dividers, screens to hide radiators, or even the walls of clothes closets (fig. 6).

The tile can be installed in a variety of patterns (figs. 1 through 8). Combinations of sizes and the use of different patterns are limited only by the taste and imagination of the user.

NOTE: Mr. Cooper, the senior author, is Associate Forest Products Technologist, North Central Forest Experiment Station, Forest Service, U.S. Department of Agriculture; he is headquartered at the Station's field office in Carbondale, Ill., which is maintained in cooperation with Southern Illinois University. Mr. Champagne (now retired) was formerly Assistant Director, U.S. Central States Forest Experiment Station, Columbus, Ohio, in charge of Forest Products, Economics, and Marketing Research.



F-516318

FIGURE 2. — A black walnut tile wainscot with V-grooved birch plywood above. The contrasting colors of the black walnut heartwood and sapwood add interest to the wainscoting.

Because of widespread interest in wood-brick tile, we are reporting here our experience in producing and applying it. The information may be helpful if you are seeking a product to make from short narrow scraps of lumber or low-grade boards. If you are an architect, decorator, or building contractor, the versatility of the tile offers new possibilities for interior finishes and designs with wood. To the homeowner and "do-it-yourselfer," wood tile may be the way to dress up an entire wall or add a point of interest to an otherwise plain wall.

The report is based on production of approximately 1,500 square feet of wood tile. About 1,200 square feet have been installed in several tests, using numerous kinds of adhesives on different types of surfaces. Service performance has been observed over a period of 5 years.

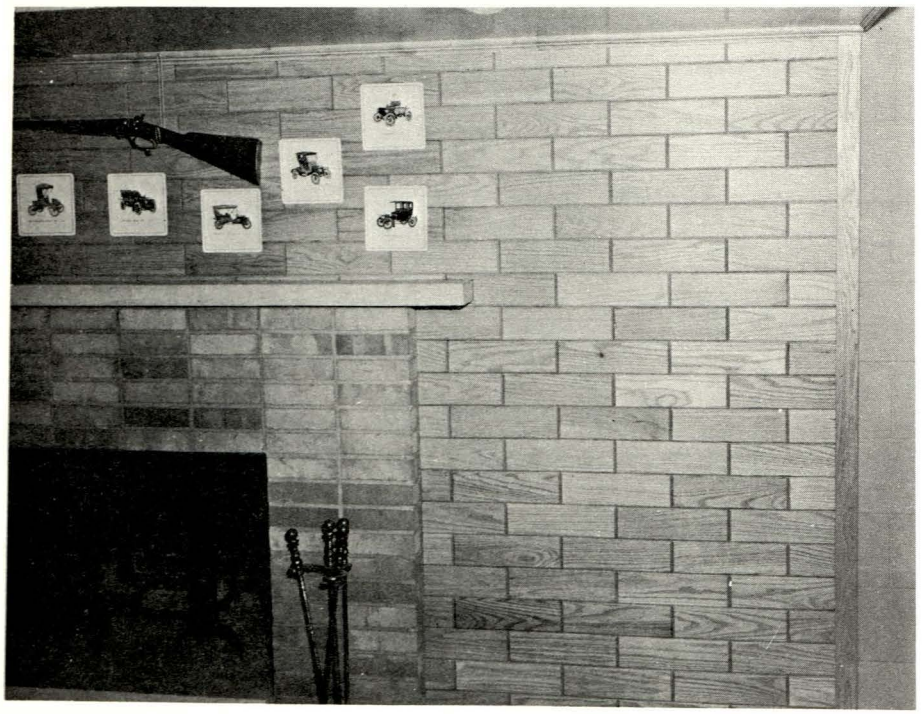
Our few problems and failures were due mainly to use of the wrong type of adhesive and to expansion of tile in a rigidly confined area. Our observations indicate that wood tile can be applied and will perform satisfactorily if precautions, discussed in this report, are taken to reduce or eliminate potential problems.

Making Wood-Brick Tile

Wood-brick tiles are rectangular pieces of wood with all four face edges chamfered at an angle of about 45 degrees. When the tiles are applied, chamfered edges of adjoining tiles form a V-groove that simulates a mortar joint.

The tile can be made from either clear wood (fig. 7) or wood with sound knots and other blemishes that add character to the tile (fig. 6). Even contrasting sapwood and heartwood can be used to add interest (fig. 2). Almost any kind of wood is suitable, but figured woods are generally the most attractive.

Wood tile can be made in a variety of sizes. Tiles 1⅝ inches wide by 12 inches long resemble Roman brick (fig. 2). Wider and shorter tiles, 2¼ inches by 9 inches, look like



F-516319

FIGURE 3. — Red oak tile with a natural finish and overlapped half their length provides a pleasant contrast to the color and texture of fireplace brick.

F-516320

FIGURE 4. — Wood-brick tile can dress up the kitchen too. Here black walnut tile is used on the wall space between a countertop and the shelves above.

common brick and can be effectively combined with larger tiles, 3½ inches by 12 inches (fig. 1).

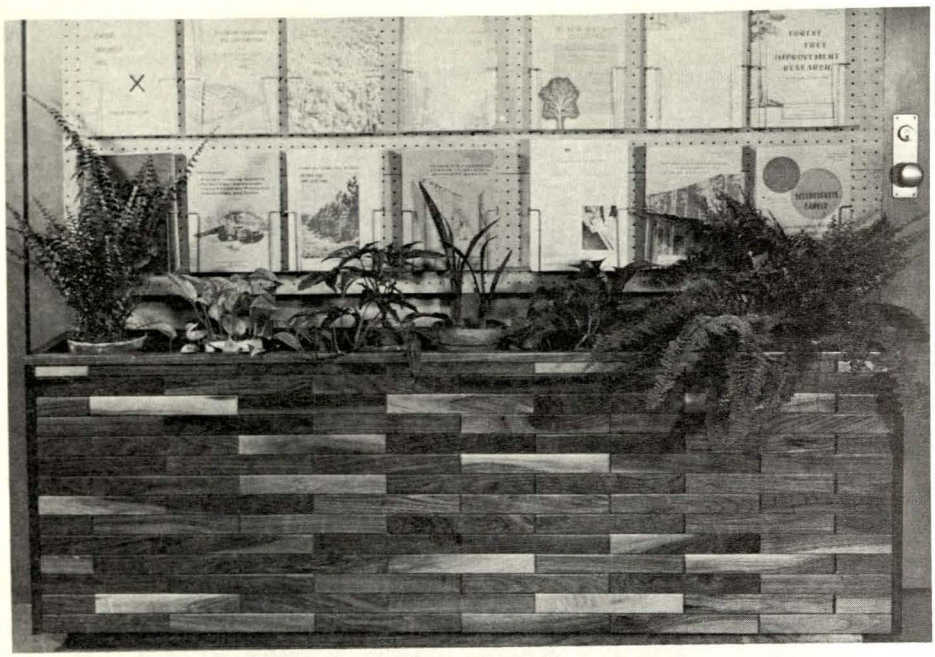
Our experience indicates that the tiles should not be more than 4 inches wide, 12 inches long, and ¾ inch thick, unless a stable wood is used. Wider tiles, especially flat-grained pieces, are apt to cup and warp out of shape. Longer tiles may bow or twist excessively. Thicker tiles are more difficult to hold in place with an adhesive and are a waste of material.

All four edges on the face side of the tile should be chamfered 45 degrees and ⅛ to ¼ inch wide, depending on thickness and style of the tile. Wider chamfers make a more noticeable joint between tiles.

We made tiles with butt-jointed, square edges, and with overlapping edges (fig. 9). Both styles have advantages and disadvantages.

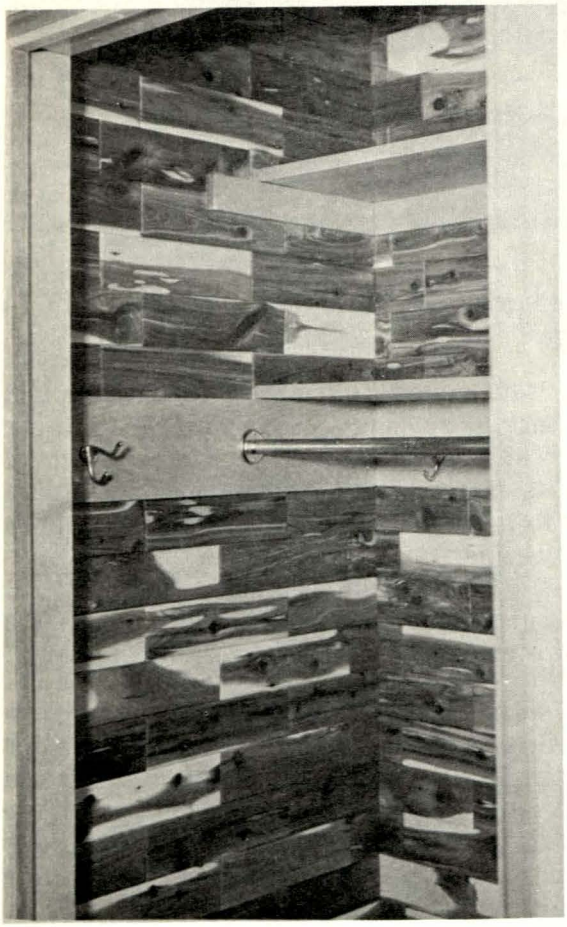
Butt-jointed tiles are easier to make and to install, but any variation in tile width or any subsequent shrinkage of the tiles will cause cracks between them. However, cracks up to 1/16 inch are not objectionable or even noticeable unless closely examined. Butt-jointed tiles should be at least ⅜ inch thick, because cracks between thinner tiles are more evident.

Tiles with overlapping sides are more difficult to make and install, and if one bows or cups after application, it may loosen tiles in the adjacent courses. However, the overlap masks any cracks between tiles that are due to variations in width from shrinkage or poor machining.



F-516321

FIGURE 5. — Decorative planters can be covered with wood-brick tile of appropriate sizes to fit many decorating schemes. Black walnut has been used here.



A "do-it-yourselfer" can make butt-jointed tiles with home workshop equipment. But commercial production of tiles in large quantities requires high-speed equipment capable of maintaining close tolerances.

Home Manufacture

Start with material ¼ inch to ¾ inch thick, with a smooth surface on at least one side. This could be new lumber, strip flooring, strip paneling, or any sound scrap wood. Many woodworking industries and shops have suitable scrap.

Cut the material to the desired length and width. Rip and cross cut accurately so the tiles will be uniform in size. Uniform *width* is especially important.

If you use material that has a tongue and groove on the edges, like strip flooring, remove the tongue for butt-jointed tiles. This can be done with hand tools or home workshop equipment either before or after the tiles have been cut to desired length. Next,

F-516322

FIGURE 6. — A clothes closet lined with brick tile made of eastern redcedar, the wood commonly used for this purpose. A logical question might be: "Why hide such a beautiful wood in a clothes closet?"

FIGURE 7. — The herringbone pattern shown here and the basket weave pattern on the front cover both require the butt-joint style of tile; the length must be a multiple of the width. Red oak is the wood used here. (Photos courtesy of Southern Illinois University.)

chamfer the four face edges of the tile. A jig will help to maintain uniformity.

Tiles with overlapping edges can be easily made from tongue-and-grooved material. Rip off the back lip of the groove, and cut the ends square. The tongue side of the tile can be chamfered with a hand plane, tilting-arbor or tilt-table saw, dado, table-mounted router, or shaper.

Overlapping tiles also can be made from square-edged material by using a router, shaper, or dado, or even by making shallow cuts with a power saw to produce the tongue and the overlap.

Finally, smooth the rough faces on the chamfers by sanding.

Commercial Production

A wide variety of equipment is used in woodworking plants. Therefore, the methods recommended here for commercial production of wood-brick tiles can be altered to fit existing equipment.

The wood, either new or scrap lumber, should be about 9- to 12-percent moisture content at time of machining.

A plant making wood tiles from rough lumber should have a conveyorized rough

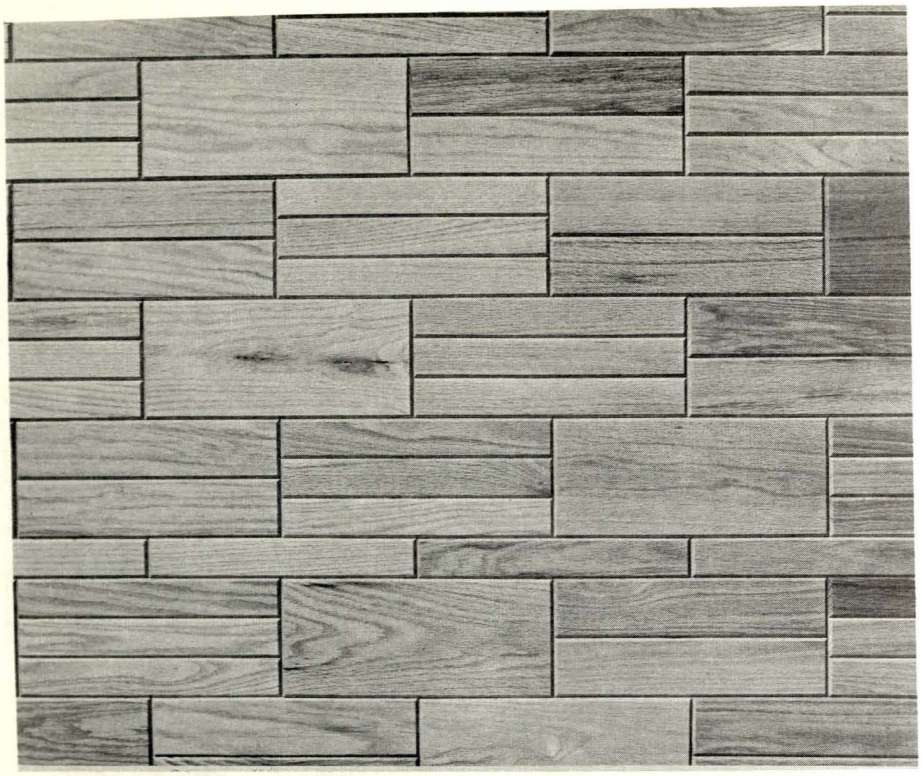
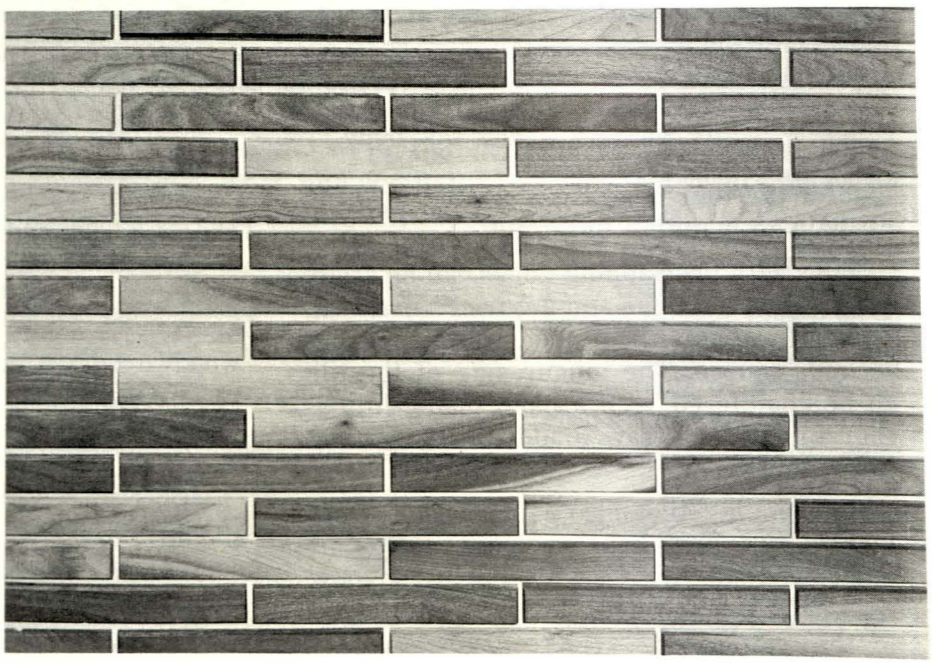
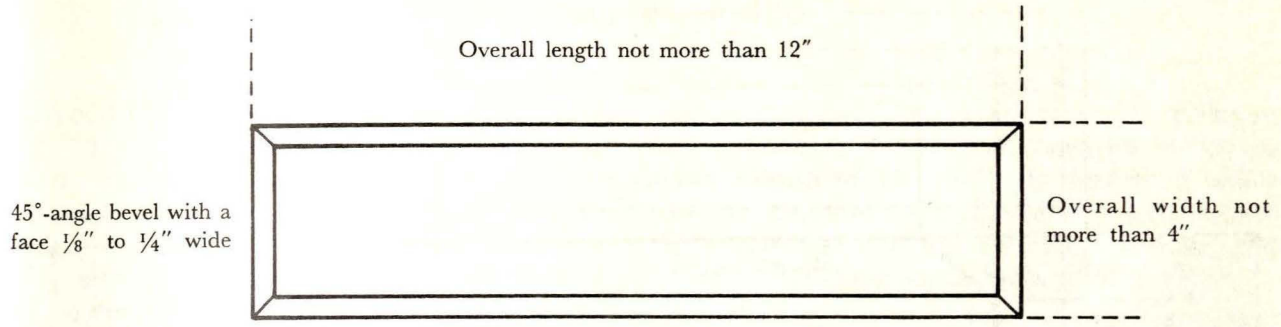
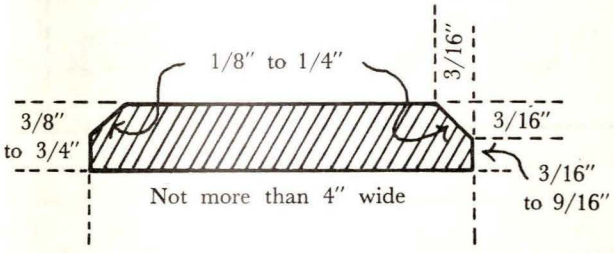


FIGURE 8. — Three widths of red oak tile (*top*) and wide spacing of black walnut tile over a light background (*bottom*) give attractive results. (Top photo courtesy of Southern Illinois University.)

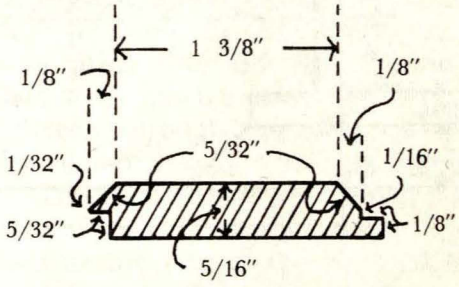




A.—Dimensions of tile face. Tiles 2¼" by 9", 3½" by 12", and 1⅝" by 12" have good proportions.



B.—Cross section of butt-jointed tile; minimum thickness of 3/8", bevel face about 1/4" wide, and bevel depth not exceeding 1/2 tile thickness.



C.—Cross section of overlapping tile that is 1 5/8" wide x 12" long x 5/16" thick; Tongue thinner and narrower than overlap edge.

FIGURE 9. — Suggested dimensions of wood brick tile.

mill with crosscut saws, a facing planer, a thickness planer, and a straight-line or gang-rip saw. For finish milling of tile, a molder, double-end tenoner, and a band resaw would be desirable. A single- or multiple-spindle shaper could be used instead of the molder and tenoner. If scrap wood is used to make tile, however, only part of the rough mill equipment may be needed.

Tiles, either the butt-joint or overlapping style, can be processed in single or multiple widths or thicknesses. A 5-head molder, with the fifth head doing the ripping is needed to produce multiple widths. Generally, the yield from either new or scrap lumber will be greater if more than one width of tile is made. This permits sorting the lumber by widths and reduces waste in subsequent ripping and machining operations. Double thicknesses can be processed in a 4-head molder or on a single- or double-spindle shaper, then resawed into two tiles. Figure 10 illustrates the pattern used to produce a double thickness of overlapping tiles, which, when resawed and face sanded, are 5/16 inch thick.

Tiles can be cut to length either before or after machining the sides. If a test shows that chamfering or crosscutting the ends results in tear-out at the edges or corners, then the ends should be chamfered or crosscut before the sides are machined.

A single- or double-end tenoner, shaper, or table-mounted router can be used to chamfer the ends. Or a smooth-cutting saw could

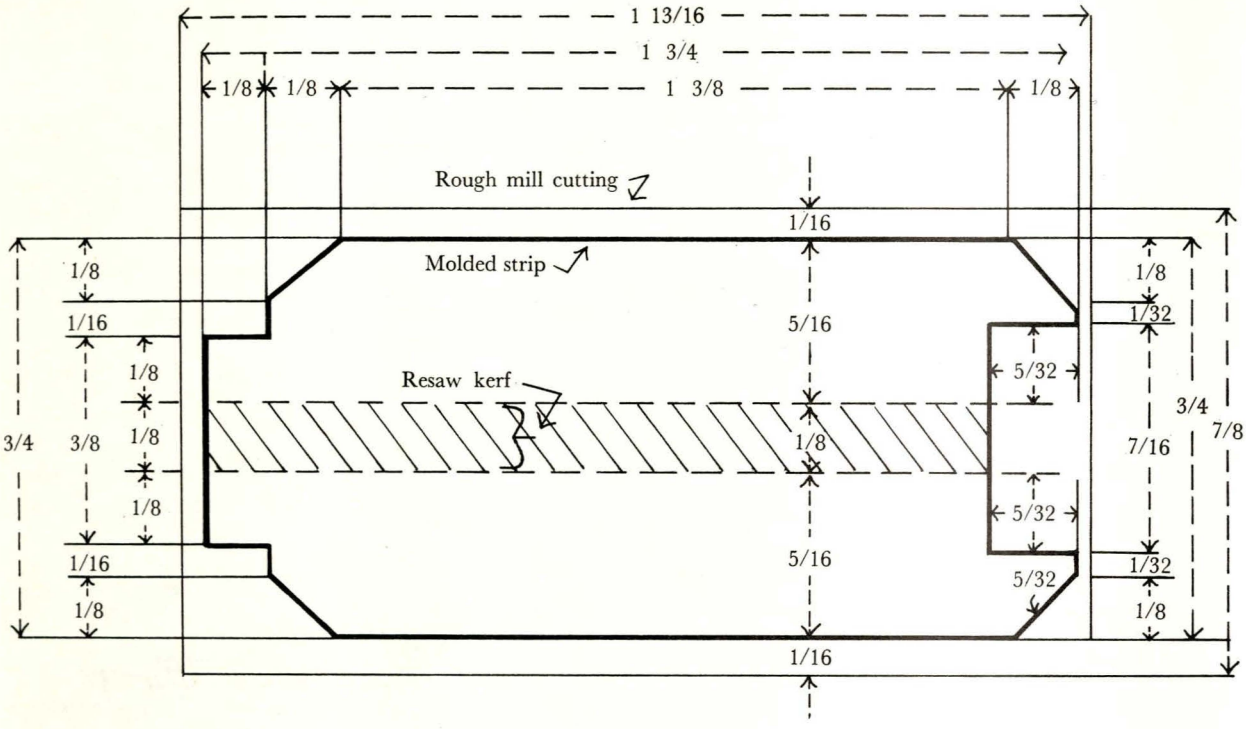


FIGURE 10. — Cross section of machining pattern used to produce a double thickness of overlapping tile, which can be resawed to make two tiles 5/16 inch thick.

be used. The end chamfers may have to be sanded to smooth them. With some species of wood, tear-out can also occur on the side chamfers of the tile. If this degrades an excessive number of tiles, it may be desirable to finish the side chamfers also by sanding. The tile face can be sanded on a 3-drum or endless-belt sander.

Other operations required in the commercial production of tile are sorting for grade or color or both, prefinishing, and packaging. How this is done is largely the producer's or consumer's choice. However, tile should be packaged in a moisture-proof container and a label attached warning against storage in hot dry areas. Otherwise, the tile may absorb or lose moisture during storage.

Applying Wood Tile

Wood tile can be applied over almost any firm, dry, comparatively smooth surface. Wood, particle board, hardboard, plaster, poured concrete, cement and cinder blocks, bricks, and metal are suitable surfaces for tiling. Old paint, varnish, and wallpaper need not be removed if it is in good, tight condition; but loose paint or paper and dust, grease, and wax should be removed. So should water-base paints if the adhesive manufacturer warns against them.

The following suggestions may be helpful when preparing a surface to be tiled.[1]

If a new surface must be installed for applying wood tile, a good-quality plywood in one of the less-expensive grades or other material with comparable strength and stability is recommended. The plywood can be of the interior type, but exterior type should be used where moisture may be a problem as in basements. The plywood or other backing material should be at least ¼ inch thick for use over an existing surface. Plywood to be nailed to furring strips or exposed studs should be ¼ to ⅝ inch thick — whichever will give the desired rigidity. It should be nailed every 6 inches around the edges and at 16- to 24-inch intervals at intermediate points.

Wood tile can also be directly applied to poured concrete, cement or cinder block, and brick surfaces if there is no seepage or condensation. Rough spots and loose cement at the mortar joints should be removed.

Special precautions are advisable, as for any paneling job, if the wood tile are to be applied on an exterior wall of a basement, below ground line, or on areas where moisture seepage or condensation exists or may occur. We used two methods described below on a cement-block basement wall where moisture seepage was a serious problem, and there have been no failures after 5 years.

Method 1. — A coat of roofing cement was troweled over the surface of the cement block wall. A sheet of 6-mil polyethylene film was pressed onto the coated area before the roofing cement dried. Exterior-type, sheathing-grade plywood, ⅜ inch thick, was then nailed in place over the film. Round-head, hardened-steel mortar nails, ¾ inch long, were driven through the plywood directly into the cement blocks (not into the mortar joints). The nails were spaced about 8 inches apart around the edges and in rows 16 inches apart across the face of the plywood sheets. The ¾-inch nails drive easier and cause less shelling or flaking of the concrete than longer nails.

Method 2. — A sheet of 6-mil polyethylene film was placed over the wall surface and held by temporary tacking across the top. Then 1- by 3-inch furring strips were nailed over the film[2] at 24-inch intervals both horizontally and vertically and across the top and bottom of the area. The strips were fastened to the cement blocks at 12- to 16-inch intervals with hardened-steel, square-cut nails, 1½ inch long. Exterior-type plywood, ¼ inch thick, was then applied over the furring strips with large-headed, ¾-inch-long, galvanized roofing nails at 8-inch intervals. (Fewer furring strips could be used with thicker plywood.) This method permitted wiring to be put back of the plywood for electrical service outlets on the wall.

When wood tile is applied, it should have a moisture content comparable to the maximum moisture content it will reach after it is applied. This is especially important if the

---

[1] *Other references that may be of interest are:*
Champagne, E. Garth. 1965. Applying paneling. U.S. Dep. Agr. Yearbook 1965: 111-118, illus.
U.S. Department of Agriculture. 1955. Wood-frame house construction. U.S. Dep. Agr. Handb. 73, 235 pp., illus.
U.S. Department of Agriculture. 1955. Wood handbook. U.S. Dep. Agr. Handb. 72, 528 pp., illus.
Numerous pamphlets, available at local lumberyards and building supply dealers, also contain instructions for applying paneling.

[2] *Furring strips and backing should not be installed flush to the floor and ceiling. Expansion spaces should be at least ¼ to ½ inch wide.*

tile is to be used in a basement room or a confined area where it is not feasible to provide expansion spaces, or in any other areas where there will be wide seasonal fluctuations in atmospheric humidity. Tiles can be conditioned by spreading them loosely within the room to be tiled and leaving them exposed to the air for at least 48 hours. Basement rooms are usually humid during the warm summer months and are good locations for exposing the tile to increase the moisture content. During winter months the tile could be exposed to high humidity in a garage, on an open porch, or elsewhere. Or the tile could be stacked loosely around an open pan of water and covered with a plastic film. If the tile cannot be conditioned to the highest moisture content expected, expansion spaces must be left along the top and bottom of the tiled area.

A mastic, gap-filling type adhesive, cement, or sealant that will not crystallize after it "sets" is recommended for applying wood tile. The adhesive should be a thick, moisture-resistant, buttery type with good initial bond strength so the tile will not sag or loosen. A tan or neutral color is best for tile that will be finished in its natural color; a dark-colored adhesive might leave an undesirable stain on the wood in case of squeeze-out at the edges.

Other materials suitable for applying wood tile are the rubber-base adhesives or cements for applying wood paneling, flooring, and ceramic tile; polysulfide or silicone sealants; or caulking compounds. The main requirements are that the material does not crystallize after setting and is water resistant.

The first course of tile must be level. A temporary leveling strip can be used under the first (bottom) course and then removed after the tile adhesive sets. This will provide an expansion space that can be covered with a baseboard. Also, expansion spaces at least ¼ inch wide at each side of the tiled area are recommended for each 4-foot width of tile surface. Providing expansion space is especially important if the tiles are not conditioned to a high moisture content before application, as discussed earlier.

The tile can be applied in a wide variety of patterns (figs. 1, 2, 7, and 8). It may be desirable to lay the tiles first on a flat surface to determine the best arrangement. Be certain to position them so that the tile sections at each end of the courses will be the same length.

The tiles on the inside and outside corners of an area may be either mitered or butted. Quarter-round molding can be put in the inside corners and a corner-molding over the outside corners.

The easiest, most convenient way of applying the tile is to put the adhesive on the back of it and then press the tile in place. Put the adhesive on the tile in fairly thick spots. If the adhesive comes in a cartridge, it can be applied with a caulking gun. Spots of adhesive ¼ inch thick and ¾ inch in diameter at each end and in the center are adequate for tiles up to 2¼ inches wide. On wider tiles four to six spots should be used. The adhesive should not be spread out or flattened on the tile. It will spread when the tile is pressed in place. Because of possible squeeze-out, the adhesive should not be applied heavily or too close to ends or edges of the tile. If, by accident, some adhesive does get on the tile face, let it set and then scrape it off with a knife.

Place the first course with the bottom edge of the tile resting on the leveling strip or other level surface. If tiles with overlapping edges are used, the overlapped edge should be up. Position the tiles as close as possible, then push them into place. Excessive and uneven pressure may cause squeeze-out, too thin an adhesive line, or loosening of adjacent tiles.

Another way to apply the adhesive is to trowel it on the wall to be tiled, then press the tiles into place. With this method, no

more adhesive should be spread than can be covered with tiles before the adhesive sets. A trowel with V-shaped notches ¼ to ⅜ inch wide and deep and 1 to 1½ inches apart is a good tool for putting the adhesive on the wall or tile backing. The trowel should be held almost perpendicular to the surface so that it will leave high ridges of adhesive.

Any tiles that are warped or have rough edges can be used best by cutting them for the ends of the courses. Or they can be put below or above eye-level where they will be least noticeable.

Thin shims such as sections of flat toothpicks can be used between courses until the adhesive sets, if some leveling or spacing of individual tiles is necessary.

A clear finish is recommended for the wood tile. It can be penetrating wood sealer, lacquer, or varnish, applied according to manufacturers' instructions. Waxing with a good-quality paste or liquid wax may also be desirable. Or the tile can be stained to any desired color or shade before final finishing.

Cooper, Glenn A., and Champagne, E. Garth.

1967. Wood-brick tile for paneling. N. Cent. Forest Exp. Sta., St. Paul Minn. 11 pp., illus. (U.S. Forest Serv. Res. Pap. NC-12)

Describes styles of hardwood-brick tile paneling; recommends produc tion and installation methods, based on a 5-year test of 1,200 square fee of wood tile on various wall materials.

Cooper, Glenn A., and Champagne, E. Garth.

1967. Wood-brick tile for paneling. N. Cent. Forest Exp. Sta., St. Paul Minn. 11 pp., illus. (U.S. Forest Serv. Res. Pap. NC-12)

Describes styles of hardwood-brick tile paneling; recommends produc tion and installation methods, based on a 5-year test of 1,200 square fee of wood tile on various wall materials.

Some Recent Research Papers of the North Central Forest Experiment Station

Forest Tree Improvement Research in the Lake States, 1965, by Paul O. Rudolf. U.S. Forest Serv. Res. Pap. NC-1, 54 pp. 1966.

Estimating Investment Returns from Growing Red Pine, by Allen L. Lundgren. U.S. Forest Serv. Res. Pap. NC-2, 48 pp., illus. 1966.

Scleroderris Canker on National Forests in Upper Michigan and Northern Wisconsin, by Darroll D. Skilling and Charles E. Cordell. U.S. Forest Serv. Res. Pap. NC-3, 10 pp., illus. 1966.

Effect of Initial Moisture Content on Performance of Hardwood Pallets, by Daniel E. Dunmire. U.S. Forest Serv. Res. Pap. NC-4, 12 pp., illus. 1966.

Forest Genetics and Related Research at the Lake States Forest Experiment Station, An Annotated Bibliography, 1924-1965, compiled by Paul O. Rudolf. U.S. Forest Serv. Res. Pap. NC-5, 35 pp. 1966.

Joint Proceedings, Second Genetics Workshop of the Society of American Foresters and the Seventh Lake States Forest Tree Improvement Conference, October 21-23, 1965. U.S. Forest Serv. Res. Pap. NC-6, 110 pp., illus. 1966.

Designing Efficient Logging Systems for Northern Hardwoods, Using Equipment Production Capabilities and Costs, by R. B. Gardner. U.S. Forest Serv. Res. Pap. NC-7, 16 pp., illus. 1966.

Promising Conifers for Western Iowa, by Gayne G. Erdmann. U.S. Forest Serv. Res. Pap. NC-8, 8 pp., illus. 1966.

Annotated Bibliography of Walnut and Related Species, by David T. Funk. U.S. Forest Serv. Res. Pap. NC-9, 49 pp. 1966.

THE FOREST SERVICE CREED

The Forest Service of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.